1   knows as concentration.[13] Concentration reduces the number of transport DS1

2   cards, decreases the number of switch ports, and spreads the cost of the

3   peripherals over a greater number of lines. Moreover, a concentrated GR-303

4   system provides a lower cost ISDN interface. If ISDN is provided by GR-303,

5   66% of the line cards that would otherwise be used can be eliminated and only

6   one DS0 is required for every four ISDN D Channels.

7 Q. **CAN YOU FURTHER EXPLAIN THE ADVANTAGES OF GR-303 AS**
8   **COMPARED TO TR008?**

9 A. Modern switching systems are typically designed to be traffic limited, rather than

10   port limited. This design allows for the cost effective sharing of costly switch

11   resources and strives to carefully balance service quality and the cost of associated

12   switch infrastructure. The design of integrated (TR008 and GR-303) switch

13   peripherals and the allocation of switching fabric to those peripherals, begins with

14   an assumption of offered traffic load. A design is required to meet the service

15   quality requirements of that traffic load. If that traffic design understates the true

16   traffic requirements of the architecture, service quality will likely deteriorate. If

17   the design overstates the traffic requirements, poor equipment utilization will

18   result. TR008 integrated designs implement concentration within the switch,

19   between the peripheral and the switching fabric. No concentration typically takes

20   place on the digital loop carrier system. During the most extreme traffic

21   overloads, switch blockage could occur when the traffic offered to the peripheral

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[13]   *See* Verizon Cost Panel Testimony at 91.

1   exceeds the capacity of the available switching fabric. Although the TR008

2   interface would still have many available idle channels, they may not be effective

3   in making or receiving calls.

4   The GR-303 architecture offers the opportunity to more closely match the

5   traffic capacity of the loop transport system and the line port requirements of the

6   switch to the designed traffic capacity of the switch. GR-303 Interface groups are

7   generally larger than TR008 Interface Groups and, therefore, will be less

8   susceptible to traffic load variations. Each line within the large GR-303 Interface

9   Group will have access to all of the traffic bearing channels within the interface.

10   Q.   **VERIZON CLAIMS THAT IDLC IS NOT COST EFFECTIVE, AND**
11   **THAT UDLC/COPPER LOOPS ARE THE MOST EFFICIENT**
12   **TECHNOLOGIES FOR UNBUNDLING LOOPS. DO YOU AGREE?**

13   A.   No. GR-303 IDLC is substantially less costly than UDLC, deploys fewer facilities

14   (concentration), is more efficient in its use of switch ports, DS1 cards and ISDN

15   provisioning, and is capable of unbundling and grooming circuits via remotely

16   provided OSS instructions. UDLC is 1970's technology, while copper loop

17   alternatives even pre-date UDLC. These technologies hardly qualify as forward-

18   looking for TELRIC purposes.

19   Q.   **ON WHAT BASIS DOES VERIZON INCLUDE ONLY MINIMAL**
20   **AMOUNTS OF GR-303 DLC TECHNOLOGY IN THE FORWARD-**
21   **LOOKING NETWORK?**

22   A.   Verizon's reason for using only small amounts of GR-303 IDLC interfaces is that

23   most of the digital switches currently employed in Verizon's embedded network

1   are TR-008 compatible and not GR-303 compatible.[14] Verizon claims that it has

2   no plans to change its embedded switch interface compatibility in the foreseeable

3   future, and thus concludes that a GR-303 interface is not appropriate. Verizon's

4   position is a perfect example of developing "forward-looking" costs based on the

5   older technologies and inherent inefficiencies within its embedded network.

6   Verizon disregards the fact that the SCIS model it uses to develop forward-

7   looking switching costs assumes the placement of all new digital switches. The

8   decision of the appropriate interface compatibility for these new switches is

9   therefore not a backward-looking one as Verizon suggests, but rather a forward-

10   looking one. In this case, the least cost, forward-looking decision is to make these

11   new switches GR-303 compatible.

12   Network-wide GR303 deployment in a forward-looking study is also

13   consistent with Verizon's own deployment guidelines. **[BEGIN VERIZON**

14   **PROPRIETARY] *** [END VERIZON PROPRIETARY]** Nonetheless,

15   instead of following its own growth guidelines, Verizon retreats to a position that

16   would essentially replicate its embedded plant.

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[14]   *See* Verizon Cost Panel Testimony at 103, Lines 3-12.

1 Q. **ARE VERIZON'S ASSUMPTIONS REGARDING THE TYPE OF**
2   **DIGITAL LOOP CARRIER INTERFACE THE SAME AS ITS**
3   **ASSUMPTIONS IN THE FIRST UNE PRICING PROCEEDING?**[15]

4 A. No. When the initial cost studies were performed in 1997, all parties, including

5   Verizon (then Bell Atlantic), agreed that IDLC equipment would be the lowest

6   cost, most efficient means to provision service. In 1997, however, the prices for

7   IDLC equipment with a next generation GR-303 interface that was capable of

8   being unbundled for the provisioning of UNE's had not yet been firmly

9   established. Instead, Verizon developed a surrogate price based in part on the

10   older, more expensive, UDLC equipment that Verizon had previously been

11   deploying.

12 Q. **CAN THE "GROOMING" OF NON-SWITCHED/NON-LOCALLY**
13   **SWITCHED SPECIAL SERVICES BE ACCOMPLISHED TODAY IN A**
14   **COST EFFECTIVE MANNER?**

15 A. Yes. With the advent of TSI in the 1990's, grooming of circuits provisioned at a

16   Remote Terminal can be achieved via a software command. New provisioning

17   OSSs can communicate directly with the DLC. The DLC takes these remote

18   provisioning instructions, makes the internal cross connections without human

19   intervention, and assigns a slot (*e.g.*, a distinct path or channel that digital signals

20   follow between DLC devices). Simply put, TSI is a form of computerized cross

21   connections. Thus, contrary to the contention of the Verizon cost panel,[16] UDLC

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[15] *See* Ex. Parte: To Determine Prices Bell Atlantic-Virginia, Inc. is Authorized to Charge Competitive Local Exchange Carriers, PUC970005 (April 15, 1999).

[16] *See* Verizon Cost Panel Testimony at 26, 93.

1   is no longer needed – or efficient – for the provisioning of non-switched services

2   or data services like ISDN and DDS.

3 **Q.   CAN EFFICIENT, IDLC LOOPS BE HANDED OFF TO CLECS?**

4 A.   Yes. Such loops are handed off to CLECs via a DS1 interface. The issue is the

5   type of tie cable arrangement that a CLEC makes via collocation in the central

6   office. Efficient connection would be at the DS1 level via a tie cable from the

7   DSX frame to the CLEC Point of Presence, rather that at the DS0 level from the

8   MDF to the CLEC Point of Presence. Presently deployed IDLC systems have a

9   feature known as virtual interface groups. Virtual interface groups were originally

10   designed to more efficiently balance the load on the switch by permitting the

11   rearrangement of circuits from the RT to the Host switch interface. However, the

12   same technology can be used to unbundle loops provisioned to the host switch by

13   simply rearranging the circuit to an interface group of a different host switch. The

14   process control to effect such unbundling ultimately resides in the SWITCH-DLE

15   system with links to SOAC, LFACS, FOMS, TIRKS, FEPS, OSP/INE, NSDB,

16   WFA/C, NMA, MARCH AND PVI.

17   Indeed, even in its testimony here, the Verizon cost panel concedes that it

18   is "hypothetically possible to support unbundling of individual loops using the

19   GR-303 interface." [17]

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[17]   Verizon Cost Panel Testimony at 94.

1 Q. **DO YOU AGREE WITH VERIZON THAT ABSENCE OF WORKING**
2 **OSS MAKES IT INAPPROPRIATE TO ASSUME GR-303 UNBUNDLING**
3 **IN A FORWARD-LOOKING NETWORK?**

4 A. No. Although Verizon tries to hide behind its claim that the Operations Support

5 Systems ("OSS") has not yet been developed to effectively permit unbundling of

6 GR-303,[18] that argument confuses issues related to provisioning GR-303 in the

7 existing network with a forward-looking scenario in which OSS will be

8 specifically designed to work efficiently with the GR-303 interface. The absence

9 of appropriate OSS is no different than the problems that existed when the Act

10 was first implemented and it was technically feasible to unbundle a loop or port

11 but the OSS to do so did not yet exist. To date, the LECs have had little incentive

12 to work with vendors to develop the OSS for GR-303 unbundling. But there is no

13 doubt that a carrier designing a forward-looking network would use GR-303 and

14 would work with vendors to put in place the OSS needed to unbundle the GR-303.

15 It would not be technically difficult to develop such OSS if the BOCs desired to

16 do so. For example, at present, the BOCs have not assigned unique three digit

17 codes to different carriers as would be necessary but creating such codes is not

18 difficult. Finally, it is important to note that even if it is not possible to place an

19 electronic flow-through order for unbundling today, there is no technical issue

20 involved with placing such an order manually.

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[18] *See* Verizon Cost Panel Testimony at 93.

1   **3.   DLC CONCENTRATION RATIO**

2   **Q.   WHAT IS A DLC CONCENTRATION?**

3   A.   Concentration is a feature available under the GR-303 interface group that allows

4   less than one DS0 on the switch per assigned channel units at the RT. Instead of

5   creating a dedicated DS0 channel to the switch, the time slot interface of the GR-

6   303 interface is used to make a connection to the switch when a customer requires

7   service. When the customer is through and the phone placed back on the hook,

8   the connection is terminated and the circuit becomes available for use by another

9   customer. The Litespan GR-303 system is designed to concentrate a minimum of

10   2,015 POTS lines onto 28 DS1's or 672 channels at the RT. This would provide a

11   minimum 3:1 concentration level for the system. But the system can also

12   concentrate far more lines, and, in many instances, this would be efficient.

13   Concentration is possible because a large portion of served customers are not

14   actually using their service at any given time. Simply put, concentration permits

15   multiple circuits to share the outside plant facility, resulting in more efficient and

16   less costly outside plant.

17   **Q.   WHAT LEVEL OF DLC CONCENTRATION HAS VERIZON USED IN**
18   **ITS FORWARD-LOOKING COST STUDY?**

19   A.   Verizon uses a DLC concentration ratio of 3:1, the minimum amount of

20   concentration possible on the system. This assumption is not explained or

21   supported anywhere in the Verizon Cost Panel Testimony. It simply appears as an

22   input to the Verizon cost study.

1 Q.   WHAT IS THE APPROPRIATE FORWARD-LOOKING DLC
2   CONCENTRATION ASSUMPTION?

3 A.   In evaluating the potential benefits of the use of GR303 in its own network,

4   Verizon assumed a [BEGIN VERIZON PROPRIETARY] *** [END

5   VERIZON PROPRIETARY] concentration ratio,[19] and this is a reasonable

6   assumption. We have nevertheless adopted an extremely conservative forward-

7   looking concentration ratio is 4:1 in our restatement of Verizon's cost study.

8   C. CABLE SIZING AND UNIT COSTS

9 Q.   ARE THERE OTHER PROBLEMS WITH VERIZON'S CALCULATION
10   OF LOOP COSTS?

11 A.   Yes. In response to AT&T/WorldCom data requests, Verizon has provided

12   supporting documentation that indicates that the data and methods used by

13   Verizon grossly overstate forward-looking costs. Specifically, these flaws cover

14   the unit cost of cable obtained from Verizon's VRUC data, metallic cable sizing,

15   telephone plant indices and the correct installed cost per foot for installed conduit.

16   Additionally, Verizon's unit cost for poles is overstated.

17 Q.   HOW DOES VERIZON DEVELOP ITS OUTSIDE PLANT CABLE
18   COSTS?

19 A.   Verizon bases its cable costs on information contained in the VRUC database.

20   According to Verizon, VRUC includes installed investments associated with fiber

21   and copper cable, which include SAI boxes, distribution terminals, drop wires,

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[19]   [BEGIN VERIZON PROPRIETARY] *** [END VERIZON PROPRIETARY]

1   NIDs, and installation and engineering costs. The installations included in the

2   VRUC data relied upon by Verizon covered the years 1997, 1998 and 1999.

3   Based on this description, it was our understanding that the VRUC

4   database contained summaries of installed cable costs from a variety of actual

5   Verizon outside plant capital investment projects. However, after reviewing some

6   of the underlying details produced by Verizon in discovery,[20] we became

7   convinced that the VRUC unit costs are not derived from actual outside plant

8   placement projects, but instead contain what appear to be estimated cable

9   installation costs resembling those typically found in a cost estimating tool. Most

10   troubling, however, is that year-to-year changes in installed cable prices,

11   particularly between 1997 and 1998, far exceed any reasonable measure of

12   inflation over that period. Because Verizon's installed cable costs are based on an

13   average of the VRUC costs over all three years, the excessive and unsupported

14   inflation in the 1998 and 1988 VRUC costs produce overstated average installed

15   costs.

16 Q. **CAN YOU PROVIDE AN EXAMPLE OF THE EXCESSIVE ANNUAL**
17   **CHANGE?**

18 A. Yes. The following table presents the underground copper cable prices from the

19   VRUC data for 1997 and 1998.

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[20]   Verizon supplemental response to Request AT&T/WCOM 1-11 (a), file
        VA_VRUC9799.mdb.

1   **[BEGIN VERIZON PROPRIETARY]**

2   *******

3   **[END VERIZON PROPRIETARY]**

4   As the table shows, the price per foot for these allegedly "actual"

5   installations of underground cable in 1998 are consistently **[BEGIN VERIZON**

6   **PROPRIETARY] *** [END VERIZON PROPRIETARY]** greater than the

7   1997 installed cost.

8 **Q.**   **HOW DO THE INFLATION PATTERNS REFLECTED IN VRUC**
9   **COMPARE TO THE TELEPHONE PLANT INFLATION INDICES?**

10 **A.**   Not well. The following table presents the change from 1997 to 1998 in price-

11   per-foot across cable sizes from Verizon's VRUC database, Verizon's

12   corresponding TPIs, and the C.A. Turner TPIs that we discuss in more detail

13   below.

14   **[BEGIN VERIZON PROPRIETARY]**

15   *******

16   **[END VERIZON PROPRIETARY]**

17   As the table demonstrates, the inflation assumptions in VRUC are far out

18   of line with inflation experienced by the telephone industry over the same time

19   period.

20 **Q.**   **ARE THERE OTHER CLUES IN THE UNDERLYING VRUC DATA**
21   **WHICH HELP CONFIRM THAT THE VRUC UNIT COSTS ARE NOT**
22   **BASED ON ACTUAL INSTALLATIONS?**

23 **A.**   Yes. For each of the three distinct types of outside plant cable contained in the

24   VRUC database – aerial, buried and underground – the incremental increase in the

1   installed cost per foot is the same. While this would not necessarily be a problem

2   if the VRUC data measured only the cable material price, it is a big problem here.

3   The VRUC costs are installed costs, which means they include both material and

4   installation labor. It is reasonable to expect that the ratio of installation labor to

5   cable material would be different among the three types of cable, particularly in

6   light of the fact that the installation cost of buried cable includes the cost of

7   digging a trench. However, Verizon's uniform change in installed costs implicitly

8   assumes that the installation labor to material ratio is the same for aerial, buried

9   and underground cable. If the VRUC data were truly derived from actual

10   installations, the difference in the installation labor to material would be captured.

11   Q.   **CAN YOU PROVIDE AN EXAMPLE?**

12   A.   Yes. The following table sets forth the difference in the 1997 installed cost per

13   foot between 300-pair and 600-pair cable and the difference between 600-pair and

14   900-pair cable for aerial, buried and underground plant from VRUC.

15   **[BEGIN VERIZON PROPRIETARY]**

16   *******

17   **[END VERIZON PROPRIETARY]**

18   Q.   **HOW IS THIS A PROBLEM?**

19   A.   Verizon uses a regression analysis of the VRUC data to develop the fixed and

20   variable components of installed cable prices for use in the outside plant

21   characteristics module. The assumption of constant incremental costs across

22   cable types renders Verizon's regression analyses and results suspect. For

23   example, the cost of the trench for buried cable does not increase linearly with the

1   size of the cable being installed because the size of the trench itself does not vary

2   considerably based on cable size. Yet, Verizon's VRUC implicitly assumes it

3   does and thereby most likely overstates the trench costs.

4   Q.   HOW DID YOU REMEDY THE PROBLEMS YOU IDENTIFIED IN
5   VRUC?

6   A.   While it would be my preference to eliminate Verizon's use of the VRUC data

7   completely from its cost study, the mechanics of the way Verizon's model works

8   renders than an impractical solution. In my restatement of Verizon's costs, we

9   continue to use the VRUC data, but we only use the cost information from 1997

10   indexed forward to 2001 levels based on the appropriate telephone plant index. In

11   this matter, we avoided the overstatement of costs produced by the excessive and

12   unsupported inflation in the VRUC installed costs beyond 1997. However, there

13   is no way to adjust for the seemingly erroneous nature of Verizon's data showing

14   that changes in cost as cable size increases are identical for different types of

15   cable.

16   Q.   ARE VERIZON'S UNIT COSTS FROM VRUC AND OTHER INTERNAL
17   SOURCES CORRECTLY ADJUSTED FOR INFLATION?

18   A.   No. Verizon uses inflation rates that are too high. Verizon's unit costs are based

19   on the cost of equipment at the time it was installed in its network adjusted for

20   inflation to determine the ostensible cost in 2001. In this proceeding, Verizon

21   uses a combination of actual and forecasted telephone plant indices (TPIs) to

22   inflate costs in its historical database to 2001 levels. The TPI's used in its cost

23   study were developed by Verizon near the end of 1999 and purport to be Verizon-

1   specific indices based on the inflation Verizon experienced through 1998. To

2   account for inflation beyond 1998, Verizon used an outdated forecast.

3   AT&T and WorldCom have asked Verizon in discovery to provide

4   documentation supporting these Verizon specific indices. To date, we have

5   received only limited supporting documentation. Nonetheless, both the Verizon

6   historical and forecast inflation indices used by Verizon appear high.

7   Verizon has not provided any explanation of why indices developed based

8   on Verizon's own experience in installing facilities within its embedded network

9   are correct to use in a forward-looking cost study. Although Verizon may hazard

10   its own justification, a more reasonable and less prone to bias source for telephone

11   plant inflation is the C. A. Turner telephone plant indices. These are publicly

12   available and are based on the experience of the industry as a whole, not just

13   Verizon's experience. In addition, the Turner indices are more recent than the

14   vintage 1999 figures used by Verizon and thus do not need to rely extensively on

15   forecasted inflation rates. These indices confirm that the inflation levels claimed

16   by Verizon in its TPIs are above those experienced industry-wide. The table

17   below compares the inflation rate for underground copper cable from 1999 to

18   2000 and 2000 to 2001 from the Verizon and C.A. Turner indices.

19   **[BEGIN VERIZON PROPRIETARY]**

20   ***

21   **[END VERIZON PROPRIETARY]**

22   The table shows the Verizon indices are far above those published by

23   Turner. Similar patterns exist for other plant accounts. In our restatement of

1   Verizon's cost study, we substituted the more current Turner Telephone Plant

2   Index values for the unsupported, forecast indices used by Verizon. We applied

3   the Turner Telephone Plant Indexes to Verizon's VRUC cable costs and to

4   Verizon's historical conduit investment costs.

5   Q.   **YOU PREVIOUSLY MENTIONED THAT VERIZON ALSO HAS A**
6   **PROBLEM WITH METALLIC CABLE SIZING. COULD YOU**
7   **DESCRIBE THE PROBLEM?**

8   A.   Verizon sizes metallic cable in the Plant Characteristics Module based on the

9   average number of working lines within each wire center. The cost of the cable

10   sized to accommodate the number of working lines is derived from the VRUC

11   regressions. Verizon converts these cable costs to an investment cost per working

12   circuit. The costs are then increased through the application of a distribution

13   utilization factor for distribution cable and a separate feeder utilization factor for

14   feeder cable. By developing the investment cost per cable based on the number of

15   working lines and then adjusting the cost upward by a utilization factor, Verizon's

16   methodology fails to reflect that the average cost per pair of metallic cable

17   declines as cable sizes increase.

18   Q.   **CAN YOU PROVIDE A SIMPLIFIED EXAMPLE?**

19   A.   Yes. Assume there are 300 working lines within a Verizon wire center. Further

20   assume that a 300-pair cable costs $12.00 per foot, 600-pair cable costs $20.00 per

21   foot, and the cable utilization factor is 50 percent. Based on the assumption of

22   300 working lines and a 50-percent utilization factor, a 600-pair cable is needed to

23   serve this hypothetical demand. Rather than use the cost per pair-foot for a 600

24   pair cable of $0.033 ($20.00/600), Verizon begins by assuming a 300-pair cable is

1   needed to serve the 300 working lines. Verizon thus uses the cost per pair-foot for

2   300- pair cable OF $0.040 ($12.00/300). To get to the 600-pair size that will

3   actually be placed in the model, Verizon divides by the 50-percent utilization,

4   thereby maintaining an effective cost per pair foot of $0.04. Simply put,

5   Verizon's method uses the unit cost for 300-pair cable when the model calculates

6   that 600-pair cable is needed. In this simplified example, cable costs are

7   overstated by more than 21%.[21]

8   **Q.   HOW DID YOU CORRECT THIS SIZING ERROR IN YOUR**
9   **RESTATEMENT OF VERIZON'S COSTS?**

10   A.   Verizon runs a regression on its installed metallic cable costs for aerial, buried,

11   and underground feeder and distribution cable to isolate that portion of the costs

12   that vary with the size of the cable (i.e., the copper pair and splicing costs) and

13   those that do not vary materially with size (i.e., the cable sheath). The fixed and

14   variable components are input to the Plant Characteristics Module and are used to

15   compute cable investment by wire center. As cable sizes increase, the constant or

16   "fixed" portion of the cable costs are spread over more cable pairs, producing a

17   decrease in the average cost per pair. To correct Verizon's sizing flaw, we

18   multiplied the constant portion of the cable regression output by the feeder fill

19   factor for feeder cable and by the distribution fill factor for distribution cable. In

20   this way, when the costs per pair are divided by the utilization factor in the loop

21   module, the resulting cost is consistent with the intended size of the cable.

---

[21]   ($0.04 / $0.033) − 1 = 0.212 or 21.2%.

1 Q.   DOES VERIZON USE THE CORRECT FORWARD-LOOKING COST
2   PER FOOT OF INSTALLED CONDUIT?

3 A.   No. Verizon develops its installed cost of conduit based on the average cost per

4   duct foot of its historic duct installations in Virginia between 1996 and 2000. In

5   relying on this historical average, Verizon ignores the clear pattern in the

6   historical conduit costs that installed costs per foot decline as the amount of

7   conduit installed increases. Table 2 displays the Verizon installed cable cost per

8   foot sorted by the total miles of conduit installed in each year.

9   **[BEGIN VERIZON PROPRIETARY]**

10   *******

11   **[END VERIZON PROPRIETARY]**

12   Under the TELRIC assumption of scorched-node, the new entrant

13   hypothesized for this costing exercise would be required to install conduit

14   sufficient to serve total demand. Because of the demonstrated economies of scale

15   associated with installing conduit, a conservative starting point for developing the

16   conduit installation cost is not the average of the historical experience used by

17   Verizon, but rather the cost associated with the largest number of miles installed

18   in an individual year, which is far less than the number of miles that would be

19   installed in a reconstructed network. We have used Verizon's installed cost per

20   conduit foot of **[BEGIN VERIZON PROPRIETARY] *** [END VERIZON**

21   **PROPRIETARY]** as the starting point for the forward-looking conduit

22   investment costs.

1   Q.   **DOES VERIZON USE THE APPROPRIATE FORWARD-LOOKING**
2   **POLE COST?**

3   A.   No. Similar to the way it develops conduit costs, Verizon relies on its historical

4   experience installing poles in Virginia as the source for its forward-looking pole

5   investment. Because Verizon Virginia's pole placements over the past five years

6   are not comparable in scope to the pole installations contemplated under the

7   scorch-node TELRIC assumptions, they do not reflect the economies of scale the

8   forward-looking entrant can achieve in installing poles sufficient to meet total

9   Virginia demand. Similar to the discussion of conduit above, pole installations in

10   the forward-looking network will benefit from the economies of sequential

11   installation, minimizing the amount of mobilization and demobilization

12   attributable to the limited pole installations reflected in Verizon's historical data.

13   A more appropriate forward-looking pole investment is the $417 per installed pole

14   used by the FCC in its Synthesis Model. We have used this investment cost per

15   pole in my restatement of Verizon's costs.

16   **D. UTILIZATION FACTORS**

17   Q.   **DID VERIZON USE THE CORRECT FORWARD-LOOKING**
18   **UTILIZATION FACTORS IN ITS DEVELOPMENT OF CLAIMED UNE**
19   **COSTS?**

20   A.   No. As Terry Murray has explained in her separate testimony for AT&T and

21   WorldCom, the fundamental error in Verizon's approach is its assumption that the

22   amount of unused capacity properly charged to current ratepayers is equivalent to

23   the amount of spare capacity that an engineer would include in the design of a

24   plant. This assumption is incorrect: the costing exercise here is conceptually

25   distinct from the task of an outside plant engineer. From a costing perspective,

1   the relevant question is not how much spare capacity should be *built* today, but

2   how much should be *charged* to today's ratepayers in current rates. As Ms.

3   Murray explains, the conceptual answer to the latter (*i.e.*, economic) question

4   requires one to estimate the present value of the future costs of building and

5   operating the capacity over its expected life, and to calculate unit costs based on

6   the net over the same expected life. The resulting cost-based prices will not

7   require current ratepayers to subsidize the future customers on whose behalf the

8   spare capacity is being built. Because an efficient firm would not build spare

9   capacity for future growth unless the present value of the future revenue from the

10   growth capacity exceeded the present value of its cost, the conservative

11   simplifying assumption is to assume away both the existence of future growth in

12   demand *and* the existence of the capacity to meet that growth. Hence, the cost of

13   plant capacity is properly attributed to current ratepayers (including CLECs, with

14   respect to local loops) *without considering any capacity needed for future growth.*

15   Moreover, even if the engineering analysis used to size plant were the

16   correct approach for attributing costs between current and future ratepayers – and

17   it is not – the engineering fill factor or capacity utilization assumptions employed

18   by Verizon in its UNE cost models are derived directly from the utilization of the

19   embedded network. TELRIC hypothesizes an efficient provider of telephone

20   services. Because the new provider is not encumbered by Verizon's embedded

21   plant configuration, it can develop an efficient design that will be able to achieve

22   higher utilization levels than Verizon's embedded plant. In addition, Verizon's

23   analysis of utilization is calculated by dividing only the *working* units or pairs by

1   the total available units or pairs. This assumption is incorrect under standard

2   engineering practice and is even inconsistent with the manner in which Verizon's

3   own engineers define utilization in actual practice. For these reasons, we would

4   recommend the following utilization rates if the Commission were (improperly, in

5   our opinion) to rely on engineering rather than economic analysis to determine the

6   efficient forward-looking amount of spare capacity: a copper feeder utilization

7   rate of 80%; a copper distribution fill factor of 60%; a plug-in equipment

8   utilization of 90%; a fiber feeder utilization of 100%; and a conduit utilization of

9   100%.

10   **1.   UTILIZATION OF DISTRIBUTION**

11   **Q.   WHAT UTILIZATION FACTOR DID VERIZON USE FOR**
12   **DISTRIBUTION CABLE?**

13   A.   Verizon used a **[BEGIN VERIZON PROPRIETARY]** *** **[END VERIZON**

14   **PROPRIETARY]** distribution cable fill factor that was based directly upon the

15   distribution fill levels currently experienced in the embedded network.[22] This

16   distribution fill is equivalent to well below the two lines per living unit

17   recommended by the SCC in the prior UNE proceeding and results in unnecessary

18   excess spare capacity in the forward-looking distribution network. Indeed, as

19   applied in the cost study, Verizon's **[BEGIN VERIZON PROPRIETARY]** ***

20   **[END VERIZON PROPRIETARY]** spare distribution pairs for each working

---

[22]   Verizon Cost Panel Testimony at 112.

1   distribution pair.[23] In other words, Verizon's distribution fill assumption places

2   approximately **[BEGIN VERIZON PROPRIETARY]** *** **[END VERIZON**

3   **PROPRIETARY]** distribution pairs for each household with a single residential

4   telephone line, **[BEGIN VERIZON PROPRIETARY]** *** **[END VERIZON**

5   **PROPRIETARY]** distribution pairs for each household with two telephone lines

6   and **[BEGIN VERIZON PROPRIETARY]** *** **[END VERIZON**

7   **PROPRIETARY]** distribution pairs for households with three telephone lines.

8   Verizon's approach thus requires CLECs to pay for layer upon layer of spare

9   capacity.

10 **Q.** **BASED ON A FORWARD-LOOKING METHOD FOR DESIGNING**
11   **OUTSIDE PLANT, WHAT IS THE APPROPRIATE DISTRIBUTION**
12   **UTILIZATION FACTOR?**

13 **A.** A highly conservative copper distribution fill for use in a forward-looking study is

14   60% or even higher.

15 **Q.** **WHY SHOULD A 60% COPPER DISTRIBUTION FILL BE**
16   **CONSIDERED CONSERVATIVE?**

17 **A.** In determining the economically appropriate amount of capacity to be attributed to

18   the user of a cable pair, one must consistently treat the costs and potential

19   revenues of spare capacity reserved for future growth. The fill factor resulting

20   from a pure economic analysis, without taking growth into consideration, should

21   be the range of 90% or so. As we discuss below, we have taken a modest amount

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[23]   **[BEGIN VERIZON PROPRIETARY]** *** **[END VERIZON PROPRIETARY]**

1   of growth into account. Even with those growth assumptions, a fill of 60% is still

2   highly conservative.

3 Q. **WHAT ROLE DO ENGINEERING GUIDELINES FOR GROWTH**
4   **CAPACITY PLAY IN DETERMINING APPROPRIATE FILL FACTORS?**

5 A. None directly. As Ms. Murray explains, the question facing the Commission here

6   is different from the one posed by engineering guidelines. Engineers ask how

7   much spare capacity should be built. The Commission's task here is to decide a

8   different question: how much spare capacity should be built *and charged to*

9   *current ratepayers*. As Terry Murray has explained elsewhere, proper

10   consideration of the present value of both the cost and the future revenue –

11   generating demand associated with growth capacity can only decrease, not

12   increase, the unit costs properly attributed to current rate payers. In any event, as

13   we discuss in what follows, application of engineering standards here would also

14   demonstrate that Verizon's proposed utilization rates are substantially too low.

15 Q. **ASSUME FOR THE SAKE OF ARGUMENT THAT THE COMMISSION**
16   **WERE TO USE ENGINEERING STANDARDS, RATHER THAN**
17   **ECONOMIC ANALYSIS, TO DETERMINE THE APPROPRIATE**
18   **AMOUNT OF SPARE CAPACITY. HOW WOULD YOUR PROPOSED**
19   **FILL FACTOR OF 60% FARE AGAINST SUCH A STANDARD?**

20 A. The 60% standard would readily pass muster even if the Commission used as its

21   benchmark the generally accepted engineering standards as the basis for its

22   decision. A forward-looking engineering analysis is not constrained by the

23   engineering rule of thumb that provides for two lines per living unit across the

24   entire service area footprint. Unlike the situation in residential developments in

25   the design phase or under construction, much of the demand in Virginia has been

1   stable for a long time. Thus, a new entrant could construct its network with far

2   fewer than two lines per household and still have significant excess capacity for

3   customers who order second lines. Under scorched-node, for those areas where

4   demand for additional lines has remained stable and is likely to remain so going

5   forward, fewer spare facilities can be provisioned, resulting in more efficient use

6   and higher utilization levels. By tailoring distribution design to meet only the

7   anticipated needs of today's demand, as TELRIC requires, distribution utilization

8   can be improved to levels well above those experienced by Verizon in its

9   embedded network.

10   Moreover, Verizon includes defective pairs as unused pairs in determining

11   its utilization factor. As explained below, there are a significant number of

12   defective pairs in Verizon's network. But in a reconstructed plant with all new

13   plant there would be very few defective pairs. In Mr. Riolo's experience, when

14   new plant is installed, there should be fewer than 1% defective pairs. Thus, these

15   pairs must be removed from the denominator of Verizon's calculation.

16

17   **Q.**   **ASSUME FOR THE SAKE OF ARGUMENT THAT THE COMMISSION**
18   **WERE TO USE THE TRADITIONAL ENGINEERING STANDARD OF**
19   **TWO DISTRIBUTION PAIRS PER HOUSEHOLD, RATHER THAN**
20   **ECONOMIC ANALYSIS OR FORWARD-LOOKING ENGINEERING**
21   **STANDARDS, TO DETERMINE THE APPROPRIATE AMOUNT OF**
22   **SPARE CAPACITY. HOW WOULD YOUR PROPOSED FILL FACTOR**
23   **OF 60% FARE AGAINST SUCH A STANDARD?**

24   **A.**   The 60% standard would readily pass muster even if the Commission used

25   Verizon's proposed engineering standards as the basis for its decision. The

26   generally accepted engineering standard for building distribution plant of two

1   lines per household. According to Verizon, residential subscribers in Virginia

2   subscribe on average to 1.18 lines per subscriber location. An 18-percent second

3   line penetration produces a distribution fill of 59 percent.[24]

4   But the 59% rate is based on Verizon's entirely improper definition of

5   utilization. Verizon defines the utilization factor for copper distribution cable as

6   "the actual utilization of terminated distribution pairs experienced in the Verizon-

7   Va. network with an adjustment for breakage."[25] For this rate case, however,

8   Verizon's definition of utilization for copper distribution omits idle dedicated

9   pairs, defective pairs, and connect-through pairs. This definition is at odds with

10   generally accepted industry guidelines, **[BEGIN VERIZON PROPRIETARY]**

11   ***** [END VERIZON PROPRIETARY]**

12   In accordance with the Serving Area Concept (SAC), distribution pairs are

13   permanently committed from the interface to each ultimate living unit. The first

14   pair is designated as the primary pair, the second pair is designated as the

15   permanent secondary pair, while all other pairs are designated as re-assignable

16   secondary pairs. Each primary and permanent secondary pair is dedicated and

17   permanently entered into the assignment record. However, engineers include idle-

18   assigned pairs and defective pairs in the numerator of the generally accepted

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[24] Two lines per living unit produces a distribution fill of 50%. 50% multiplied 1.18 subscriber lines per location increases distribution fill to 59% (0.50 x 1.18 = 0.59).

[25] Verizon Cost Panel Testimony at 113.

1   engineering definition of fill factors.[26] Similarly, Verizon's own engineering

2   guidelines state that **[BEGIN VERIZON PROPRIETARY] *** [END**

3   **VERIZON PROPRIETARY]**

4   Therefore, when utilization rates are compared with traditionally accepted

5   engineering standards, consistency dictates that the primary and secondary

6   permanent cable pairs should be counted in the numerator of the ratio.

7   Accordingly, two pairs per household -- as opposed to 1.18 lines per subscriber --

8   should be included in the numerator of the fill ratio. Defective pairs should also

9   be included. This is so for a second reason as well. As set forth below in the

10   discussion of fiber feeder, a reconstructed network would have no defective pairs.

11   If these are included, the utilization rate is substantially above the 60% we have

12   conservatively assumed.

13   **Q.**   **VERIZON STATES THAT THE EFFECT OF CHURN WILL REDUCE**
14   **THE COPPER DISTRIBUTION UTILIZATION RATE. DO YOU**
15   **AGREE?**

16   **A.**   No. Subscriber churn, as defined by Verizon, would only change the cable pair

17   status from working to idle assigned, with the net result that the utilization fill

18   remains the same. For these reasons, coupled with the fact that any defective

19   cable pairs would also increase the utilization factor, Verizon's Copper

20   Distribution Cable Utilization can conservatively operate with a 60% fill.

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[26]   Two lines per living unit produces a distribution fill of 50%. 50% multiplied 1.18
subscriber lines per location increases distribution fill to 59% (0.50 x 1.18 = 0.59).

1 Q. **VERIZON CLAIMS THAT ITS LOW DISTRIBUTION FILL LEVELS**
2 **ARE NECESSARY TO AVOID COSTLY AND DISRUPTIVE**
3 **REINFORCEMENT OF ITS OUTSIDE DISTRIBUTION PLANT. DO**
4 **YOU AGREE?**

5 A. No. The Verizon Panel defends its low distribution fill factor in part by

6 suggesting that a higher fill will require costly and disruptive relief of the outside

7 distribution plant. That argument is simply a variant of the erroneous claim that

8 current ratepayers should pay for capacity stockpiled to meet future growth.

9 Furthermore, AT&T/WorldCom have asked Verizon Virginia to provide

10 information relating to its distribution relief jobs in its Virginia service territory

11 over the last three years. Although Verizon objected to this request,[27] I believe

12 that most of the distribution relief jobs undertaken by Verizon in Virginia were

13 not because of exhausted outside plant facilities, but instead were for replacement

14 of facilities that had deteriorated over time and thus were generating a high

15 number of service trouble reports. This would suggest that Verizon's existing

16 distribution fill levels are so low that it is virtually guaranteed that distribution

17 cable will not exhaust before reaching the end of its useful life. While this may be

18 Verizon's goal in designing its outside plant, it does not reflect the practice of a

19 least-cost, efficient provider.

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[27] Response to AT&T/WorldCom #1-47.